Measure what you see

byko-swing

Operating Instructions

A member of ALTANA

BYK

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1 Introduction

Dear customer,

thank you for having decided for a BYK-Gardner product. BYK-Gardner is committed to providing you with quality products and services. We offer complete system solutions to solve your problems in areas of color, appearance and physical properties. As the basis of our worldwide business, we strongly believe in total customer satisfaction.

Therefore, in addition to our products, we offer many VALUE-ADDED services:

- Technical Sales Force
- Technical and Application Support
- Application and Technical Seminars
- Repair and Certification Service

BYK-Gardner is part of Altana AG and a direct subsidiary of BYK, a leading supplier of additives for coatings and plastics. Together, we offer complete and unique solutions for you, our customer.

Thank you for your trust and confidence. If there is anything we can do better to serve your needs, do not hesitate to let us know.

Your BYK-Gardner Team

https://www.byk-instruments.com

1.1 About this Document

This instruction manual is an important part of this instrument. It contains essential information about setting up, placing in service and use. If you pass the device on to another user, please ensure that the instruction manual is included with the instrument. The manual must be studied carefully before working with the equipment. Please contact your regional service office if you have any questions or require additional information about the device.

- https://www.byk-instruments.com/contact-infos

The technology and fittings are based on state-of-the art optic and electronic technology. New developments and innovations are constantly being integrated into the equipment. Thus, the diagrams, dimensions, and technical data used in this manual may have changed as a result of adapting the device to new information and improvements.

1.2 Safety Information

1.2.1 General Information

If used appropriately, no hazard is to be expected either mechanically or electrically.

The instrument complies with the safety requirements of actual standards. Even so read the safety instructions and use the instrument accordingly to prevent injuries and material damages.

The instrument can be disconnected from power:

- by pulling the plug out of the external power supply,
- by disconnecting the DC plug from the external power supply to the instrument.

Make sure that the power plug is always easy to access!

Any damage or injury caused by ignoring the safety instructions, general information or improper usage, no warranty or product liability from the manufacturer can be claimed.

Keep this manual for reference always near by the instrument.

In case of transferring the instrument, make sure this manual is included.

1.2.2 Symbols and Terms

In this documentation following symbols and terms are used.

1.2.2.1 Symbols

This symbol warns against physical injury or material damage.

This symbol warns against electrical hazard.

This symbol marks additional information.

1.2.2.2 Terms

The term “Danger”

Marks life-endangering hazards.

The term “Warning”

Marks non life-endangering hazards.

The term “Caution”

Marks possible material damages.

The term “Notice”

Marks possible additional information.

1.2.3 Safety Instructions

Make sure to observe the following safety instructions.

1.2.3.1 Danger

Before starting, read the manual and follow the safety instructions and general information.

Unpack the instrument and check the delivery contents for completeness - refer to Delivery Contents [▶ 25].

If safe usage of the instrument is obviously impossible, immediately put the instrument out of action and prevent it from unintentional activation. Safe usage is impossible:

- if the instrument is visibly damaged
- or does not work anymore
- after long-storage under bad conditions
- after heavy transport stress

Do not perform any electrical or mechanical repair. The instrument may only be opened by a trained service technician. Please contact our technical service for assistance.

Only devices conforming to the safety standards for low voltage appliances are allowed to be connected to the DC input.

Use the original accessories available for the instrument, additional information can be found in Delivery Contents [▶ 25] and Technical Data [▶ 30].

Use only the power supply and connection cable delivered with the instrument.

1.2.3.2 Warning

The instrument consists of sensitive optical, mechanical and electronic precision parts. Handle the instrument like a high precision measurement device:

- Do not drop and avoid stress due to vibration and shock.
- Do not expose the instrument to high humidity and condensation for a long period.
- Avoid contact to chemicals, splash-water and other liquids.

To avoid damage during transport ship the instrument in the original packaging only. Retain the packaging in case you want to ship the device at a later date.

1.2.3.3 Warning

Before operating the instrument with the provided power supply, make sure the input voltage of the supply is the same as the mains voltage (refer to the type label).

Do not position the instrument at a location with direct sunlight.

Do not position the instrument at a place where it is exposed to dust, heat or vibrations.

Protect the instrument from humidity, chemicals, and corrosive vapors.

Do not use acetone for cleaning the instrument.

Use a moist soft cloth for cleaning. For heavy soil use ethanol or cleaning alcohol.

1.2.3.4 Caution

Please note the following points for handling the device:

- Please unpack the device carefully.
- The device is heavy - it weighs more than 18 kg (40 lbs).
- Always transport the device with the help of a second person.
- It is a stationary device - it must not be transported or moved during operation.

1.3 Disposal Information

Disused electrical equipment such as this instrument must be professionally disposed. Do not dispose it in household garbage and make sure to observe the national law in your country.

1.4 Exclusion of Liability

Disclaimer

No liability other than as provided by law is assumed for direct or indirect damage sustained in association with the use of the instrument, the software or documentation.

BYK-Gardner precludes all liability claims if the usage described in Intended Use [▸ 11] is disregarded.

Any other usage than described in Intended Use [▸ 11] is not according to the purpose of the instrument and leads to termination of liability claims.

1.5 Copyright Information

Specific properties and structural characteristics of the instrument are intellectual property of BYK-Gardner. The copyright of this manual remains with BYK-Gardner.

This document must not be reproduced fully or in party, published or used for any other competitive purposes, no matter whether against payment or not, without prior written authorization from BYK-Gardner.

BYK-Gardner reserves the right to update the instrument, software and written documentation without prior notice.

1.6 Declaration of Conformity

We,

BYK-Gardner GmbH

Lausitzer Strasse 8

D-82538 Geretsried

declare, that this instrument complies with the requirements of the following EU directives:

- 2014/30/EU - Electromagnetic Compatibility
- 2014/35/EU - Low Voltage

The following harmonized standards were applied:

- EN 61010-1:2010
- EN 61326-1:2013

Geretsried, November 09th, 2020

Frank R. Wagner

Managing Director

2 System Description

2.1 Intended Use

The **byko-swing** hardness tester is an instrument to determine the elastic hardness of coatings according to DIN EN ISO 1522 and ASTM D 4366. It consists of a sample holder where a pendulum freely swings on the sample surface and a counting device.

The number of swings in a defined angular range is a measure for the elastic hardness of a coating. It is expressed in seconds or number of swings. The number of swings is detected by light barriers in the lower part of the instrument and is shown on the display as seconds or swings.

The **byko-swing** offers a fully automatic measurement mode - no manual interaction is required.

2.2 Supported Features

- Compliant with ASTM D4366 and ISO 1522
- Digital counter to display and record the test results
- Selector switch to display either swings or seconds
- Acoustical signal to notify operator the completion of test
- Protective cover to eliminate influence of air currents
- Four full automatic measurement modes
- Easy changeover of the pendulums
- Automatic power off after 1 hour
- Restore of results after power on

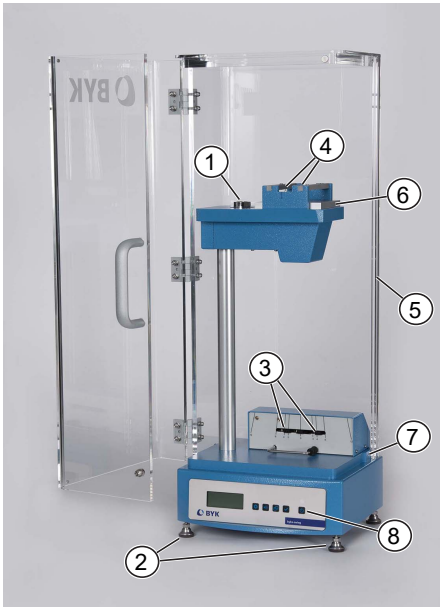
2.3 Available Models

- 5865: Pendulum hardness tester **byko-swing** with König pendulum
- 5866: Pendulum hardness tester **byko-swing** with Persoz pendulum
- 5867: Pendulum hardness tester **byko-swing** with both pendulums

3 Getting Started

3.1 Overview of Parts

Unpack the instrument and check for possible transport damage. Before starting make sure delivery is complete.



1	Bubble level	2	Leveling feet
3	Light barriers	4	Pins for pendulum
5	Protective cover	6	Automatic lifting table
7	Door sensor to ensure cover is closed during measurement	8	Power switch and status LED

Notice

The device is heavy - transports are to be done with the help of a second person. Retain the packaging in case the instrument needs to be shipped.

3.2 Setting up the Instrument

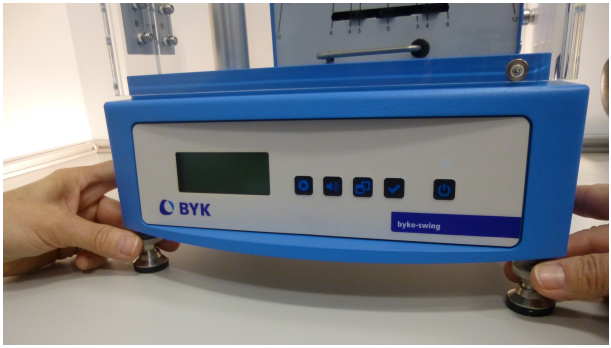
Pendulum hardness testers are as sensitive as precision balances.

Notice

A vibration free position on a special table suitable for balances is recommended.

To setup the instrument:

1. Place the instrument on a vibration free surface.
2. Connect the external power supply, socket on back site.
3. Balance the bubble level (1) properly with the leveling feet (2).

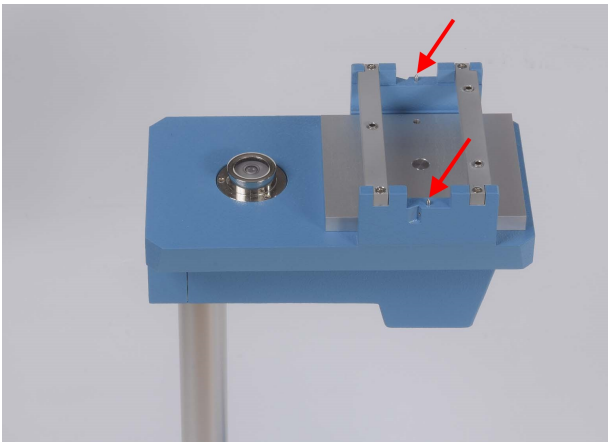


4. Check the bubble level on top.

The bubble must be exactly centered.

3.3 Inserting the Pendulum

Place the pendulum exactly with the small holes on the tapered pins of the lifting table.



The marking arrow on the bar of the pendulum **must point to the front**.

Caution

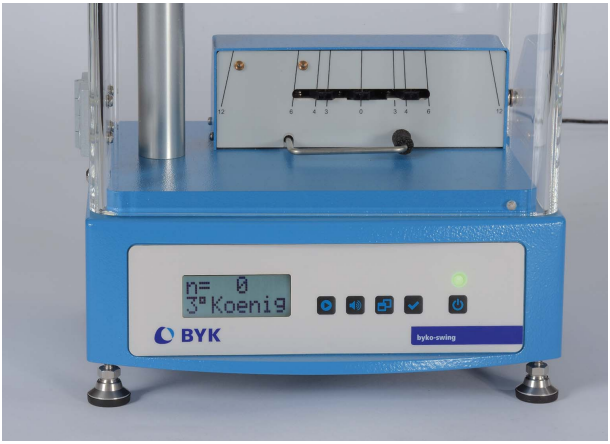
If pendulum is placed the wrong way, light barriers and counter are inoperable.

To check the correct position:

1. Close the door of the protective cover.
2. Check the position of the pendulum to the scale. The completely stopped pendulum must point exactly to the zero marking of the scale.
3. If not, check the tip of the pendulum. If twisted, straighten it.
4. Repeat this procedure three times to assure an equal rest.
5. Double check the bubble level, correct the leveling if necessary.
6. When bubble is centered, lock the screw feet with the counter nuts.

The **byko-swing** hardness tester is now ready for operation. You can check the correct function of your instrument with the procedure described in Testing the Instrument [▸ 23].

3.4 Powering the Instrument



To switch the instrument on:

1. Check the connection of the power supply on the back site.
2. Switch the instrument on via button **Power**.
3. The status LED lights up green.

To switch the instrument off:

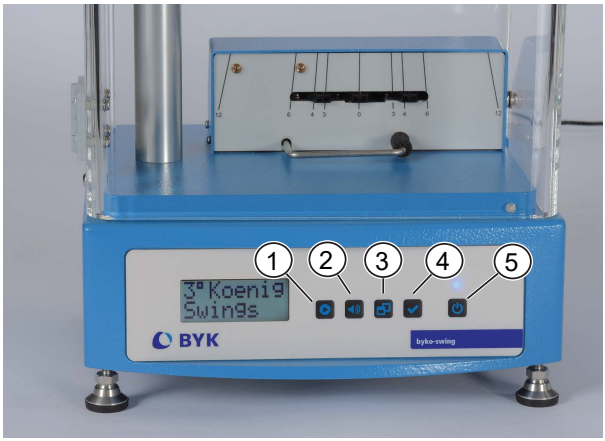
1. Check if the status LED lights up green.
2. If status LED is blue, use button **Enter** to confirm.
3. If status LED is red, use button **Start/Stop** to abort.
4. Switch the instrument off via button **Power**.

The instrument switches off automatically after 1 hour of inactivity. If the instrument is switched on again, the latest settings and results are restored.

Notice

In the measuring mode a fully automatic sequence is carried out. Keep the door closed.

3.5 Controlling the Instrument



The instrument is operated by the buttons on the front panel:

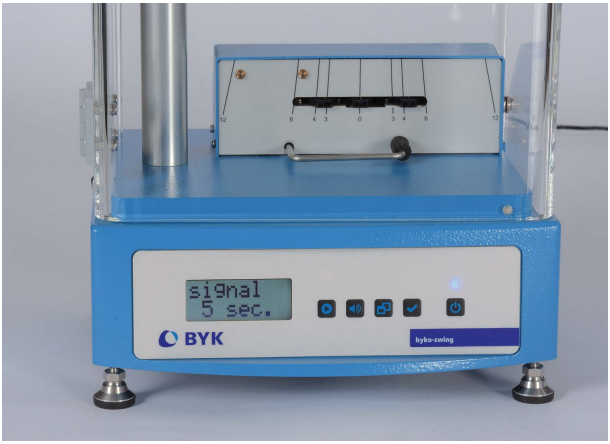
1. **Start/Stop**
2. **Signal**
3. **Modus**
4. **Enter**
5. **Power**

The status LED uses following colors:

- None: *Power off*
- Green: *Ready*
- Blue: *Confirm*
- Red: *Busy*

The instrument can only be operated if the status LED lights up green.

3.6 Setting up the Sound



To setup the acoustic signal:

1. Press **Signal** multiple times to toggle through the settings, the LED lights up blue.
2. Following settings are available:
   - 5 sec.
   - 15 sec.
   - 60 sec.
   - Infinite "∞"
   - Off "---"
3. Confirm with **Enter**, the LED lights up green.

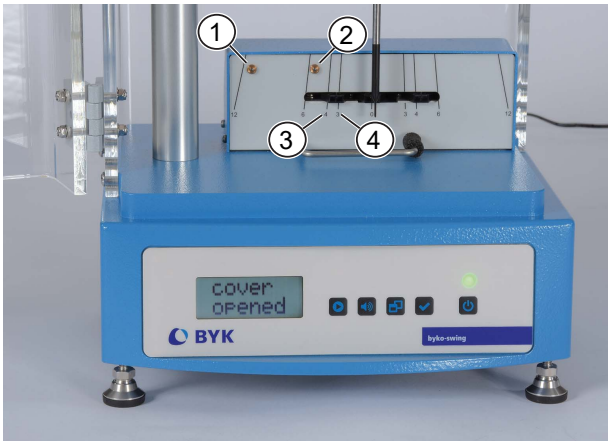
The sound setup is not possible if the **Start/Stop** function is active - indicated by red LED.

4 System Operation

The **byko-swing** hardness tester is delivered calibrated and ready for use.

4.1 Measurement Principle

The instrument can measure according to "König" and to "Persoz". These measurement methods are defined by a starting angle, the amplitude to be reached by the pendulum and the resulting swings.



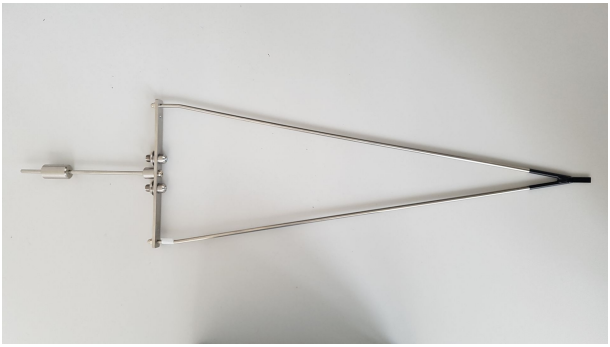
1	12°: Starting angle for Persoz	2	6°: Starting angle for König
3	3°: Light barrier for König	4	4°: Light barrier for Persoz

In both scenarios the measurement is finished, when the given amplitude is not reached by the pendulum anymore.

Notize

It is possible to use one instrument for both methods “König” and “Persoz”. Change the pendulum (see Delivery Contents [▶ 25]) and change the method (see Measurement Modes [▶ 21]).

4.1.1 Pendulum König (5856)



Following rules apply for pendulum König:

- Pendulum starting angle: 6°
- Amplitude / light barrier: 3°

For test results on the glass standard see Expected Results [▶ 24].

4.1.2 Pendulum Persoz (5857)

Following rules apply for pendulum Persoz:

- Pendulum starting position: 12°
- Amplitude / light barrier: 4°

For test results on the glass standard see Expected Results [▶ 24].

4.2 Measurement Modes

The following four measurement modus and corresponding outputs are available by pressing the button **Modus** (4).

3° König	3° König	4° Persoz	4° Persoz
Swings	Time	Swings	Time
n = 000	T = 000 s	n = 000	T = 000 s
3° König	3° König	4° Persoz	4° Persoz

Caution

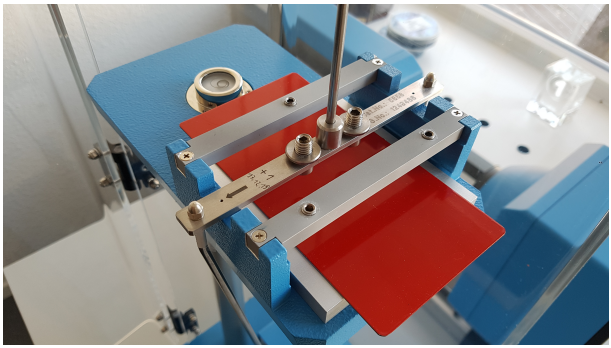
Do not touch the balls of the pendulum at insertion or replacement. If touched, clean them with isopropanol.

4.3 Performing Measurements

For measuring the hardness of a coating the sample is placed on the lifting table. Following rules apply:

- Maximum distance from the front to the back should not exceed 100 mm. So there remains a clearance of 3 mm, which is necessary to avoid locking/ tilting the sample.
- The distance from the center of the sample table to the left of the housing is 150 mm. From the center of the sample table to the right to the housing it is 90 mm. In total it is 240mm.
- Optimal size of the sample is 100mm x 100 mm. In this case the sample can be rotated, if necessary.
- The smallest dimension is limited by the three upper stops, the smallest possible dimension is 65 mm x 75 mm.
- The maximum height of the sample is approximately 8.5 mm.

Following picture shows a sample of ~ 150 mm x 80 mm.



To perform a measurement:

1. Power on the instrument.
2. Place sample on the automatic lifting table.
3. Clean the balls of the pendulum with isopropanol.
4. Select appropriate method with button **Modus**, status LED lights up blue for *Confirm*.
5. Confirm with **Enter**, status LED lights up green for *Ready*.
6. Optional: Adjust duration of acoustic end signal with button **Signal** and confirm with **Enter**.
7. Press button **Start/Stop**, status LED lights up red for *Busy*.
8. Measurement starts, wait until measurement finishes.
9. Keep the door closed during measurement.

At the end of the measurement the LED lights up green and the optional signal sounds. The measurement result is shown on the display.

Notize

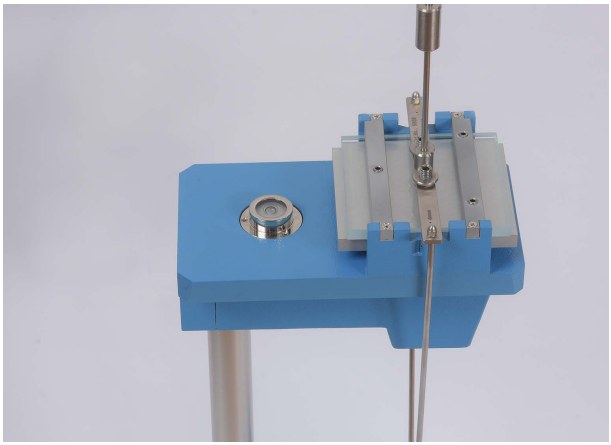
1 The device can only be operated with the door closed - the clamping protection is necessary due to the automation - a message "Door open" appears.

2 If selected measurement mode does not match the inserted pendulum, a message "Wrong pendulum" appears.

3 Measured values will always be lower than the results on the glass standard – see Expected Results [▸ 24].

4.4 Testing the Instrument

Pendulum and light barrier are adjusted at delivery. A periodical re-certification by authorized service personal is recommended for equipment monitoring.



For periodical control of the instrument, it is recommended to measure **once a week** on the glass standard included in delivery.

4.4.1 Testing Procedure

To check the measurement accuracy:

1. Power on the instrument.
2. Clean the glass calibration standard by soft, lint-free cloth with isopropanol. Use always a new cloth for cleaning.
3. Remove any sample and place the glass standard on the automatic lifting table.
4. Select appropriate method with button **Modus**, status LED lights up blue for *Confirm*.
5. Confirm with **Enter**, status LED lights up green for *Ready*.
6. Optional: Adjust duration of acoustic end signal with button **Signal** and confirm with **Enter**.
7. Press button **Start/Stop**, status LED lights up red for *Busy*.
8. Measurement starts, wait until measurement finishes.
9. Keep the door closed during measurement.

At the end of the measurement the LED lights up green and the optional signal sounds. The measurement result is shown on the display.

4.4.2 Expected Results

If the following values cannot be obtained, re-clean the glass panel and the balls of the pendulum, re-check that the glass panel is leveled, and re-test.

	Swings (n)	Time (s)
Pendulum hardness König	172 – 185	250 +/- 10
Pendulum hardness Persoz	415 – 445	430 +/- 15

If these values are still not obtained by the instrument, send it to BYK-Gardner service team for re-calibration.

4.4.3 Related Standards

The elastic hardness of coatings is described in following standards:

- ASTM D 4366
- DIN EN ISO 1522

5 Appendix

5.1 Delivery Contents

Product details see https://www.byk-instruments.com/c/p-44882.

5.1.1 Pendulum Tester König

- Basic device (5865)
- Pendulum König (5856)
- Glass calibration standard
- Protective cover acrylic glass
- Power supply
- Power cord EU
- Power cord US
- Safety Instructions
- Short Instructions

Product details see https://www.byk-instruments.com/p/5865.

5.1.2 Pendulum Tester Persoz

- Basic device (5866)
- Pendulum Persoz (5857)
- Glass calibration standard
- Protective cover acrylic glass
- Power supply
- Power cord EU
- Power cord US
- Safety Instructions
- Short Instructions

Product details see https://www.byk-instruments.com/p/5866.

5.1.3 Pendulum Tester König/Persoz

- Basic device (5867)
- Pendulum König (5856)
- Pendulum Persoz (5857)
- Glass calibration standard
- Protective cover acrylic glass
- Power supply
- Power cord EU
- Power cord US
- Safety Instructions
- Short Instructions

Product details see https://www.byk-instruments.com/p/5867.

5.2 Firmware Updates

On the back site the instrument provides a USB interface for updating the firmware of the operating system.

You will receive software updates while we perform service on your instrument. You can find your nearest service point on our website:

- https://www.byk-instruments.com/contact-infos

5.3 Troubleshooting

Problem	Cause	Solution
Counter does not work properly.	Pendulum not attached properly.	Attach pendulum with arrow to the front.
	Balls of pendulum are dirty.	Clean the polished balls of the pendulum.
Message "Wrong pendulum" appears.	Pendulum does not match selected modus.	Choose correct modus or changeover pendulum.
Message "Door open" appears.	Measurements are possible only with door closed.	Close the door before starting.
Message "Abort" appears.	Measurement was interrupted before finishing.	Do not press start/stop button before measurement finishes.
	Door was opened before finishing.	Keep door closed during measurement.
Button (start or power off) seems not to work.	Changes not confirmed. LED lights up blue.	Confirm the last change. LED lights up green. Repeat.
Pendulum moves out of position.	Pendulum not placed on the pins of the lifting table.	Place pendulum exactly with the small holes on the pins of the lifting table.
No display.	Power supply not plugged in properly.	Check power connection.

5.4 Technical Data

Temperature Range	10° C to 40° C (50° F to 104° F) for operation	
	0° C to 60° C (32° F to 140° F) for storage	
Relative Humidity	Up to 85% non-condensing at 35° C (95° F)	
Operation Altitude	Up to 2000 m (6561 ft)	
Dimensions (LxWxH)	280 x 253 x 770 mm (11.0 x 10.0 x 30.3 in)	
Weight	18.4 kg (40.6 lbs)	
Interface for SW-Update	Micro USB	
Power Supply Device	Input	9 V DC ; max. 3 A
External Power Supply	Input	100 - 240 V AC ; 50 – 60 Hz; max. 1 A
	Output	9 V DC ; max. 3.34 A
	Dimensions (LxWxH)	100 x 50 x 33 mm (3.9 x 2.0 x 1.3 in)
	Weight	210 g (0.5 lbs)

5.5 Service Points

For all service and spare parts requirements, please contact your local BYK-Gardner office.

Headquarter Germany c/o BYK-Gardner GmbH Lausitzer Strasse 8, 82538 Geretsried, Germany	**Headquarter USA** c/o BYK-Gardner USA 9104 Guilford Rd., Columbia, MD 21046, USA	**Headquarter PTE** c/o BYK USA dba Paul N. Gardner 316 N.E. First Street Pompano Beach, FL 33060 - 6608, USA
Service Point Austria, Hungary, Slovenia c/o Friedrich W. Bloch GmbH Wagramerstrasse 201, 1210 Vienna, Austria	**Service Point France** c/o Eckart France S.A.S. 31 Rue Amilcar Cipriani 93400, Saint Ouen, France	**Service Point Spain** c/o Actega Artística S.A.U. Calle Balmes 8, Suite: 3º 2ª, 08291 Ripollet, Spain
Service Point Mexico c/o Exacolor Laboratories S.A. de CV Barranquilla 150, Col. Alta Vista CP 64840, Monterrey, Mexico	**Service Point South Latin America** c/o MAST Comercial e Importadora LTDA Rua Itaporanga, 340-B, Bairro Paraiso, Santo André - SP, 09190-640, Brazil	**Service Point China** c/o BYK (Tongling) Co. Ltd. Block 6A, Building A, No. 88 Hong Cao Road, Shanghai 200 233, P.R. China
Service Point India c/o BYK India Pvt. Ltd. 147 Mumbai Pune Road, Pimpri, Pune 411 018, India	**Service Point Japan** c/o Tetsutani Co. Ltd. Chuo-ku, Osaka, Tokui cho 2-2-2, Japan	**Complete List** https://www.byk-instruments.com/global-service-centers

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